Iowa Department of Natural Resources
Environmental Protection Commission

ITEM **8** **DECISION**

TOPIC **Contract – USGS – Cooperative Monitoring FFY09**

The Department requests Commission approval of a contract in the amount of $547,250 with the United States Geological Survey for stream gaging, flood prediction, groundwater level measurements, and stream water quality monitoring at large rivers.

The purpose of this Agreement is:
Load Exports of Major Iowa Rivers Report or the "Big Rivers" project collects water quality measurements on 10 major tributaries from Iowa. Consistent, representative water-quality data from the major rivers draining Iowa have been collected since 2004. With five years of the study completed, it is now time to document quantification of loads of nitrogen, phosphorus, sediment, and pesticides that are transported to the Missouri and Mississippi Rivers. A secondary purpose of the report is to determine if changing land-use and agricultural practices result in subsequent changes in the water quality in major rivers in Iowa. This knowledge will assist in the development of strategies to limit human impacts on the rivers and to evaluate the success (or failure) of these strategies once implemented.

PRMS Flood Model Comparison Iowa had major flooding that occurred across the state in 1993, and in 2008 there has been a reoccurrence of major flooding across the state. In eastern Iowa, the Cedar River USGS stream-gaging station at Cedar Rapids (05464500) had all time record streamflows and gage heights. In 1993, the Cedar River hit a peak flow of 71,000 cubic feet per second (cfs), and a streamgage height of 19.27 feet (ft), in comparison to 2008, streamflow was 150,000 cfs, and 31.10 ft. The 2008 flood on the Cedar River was the largest historical flood of record at Cedar Rapids. The Precipitation Runoff Modeling System (PRMS) will be used to develop models of both major flood events along the Cedar River (Markstrom and others, 2008). The objective of the modeling is to compare and understand the Cedar River floods of 1993 and 2008; the comparison will include similarities and differences of meterologic, hydrologic, landform, and land use conditions leading up to each event.

Water Quality Modeling (SPARROW) The project includes a long term goal to develop the ability to estimate stream water quality along any stream at any point. The estimation methods need to include the ability to change watershed and hydrologic characteristics so as to simulate what water quality changes would likely occur if the watershed characteristics were to change (for example if retention areas were constructed in the watershed or impervious area was to increase). The Cedar River basin will be modeled using the water-quality model: Soil & Water Assessment Tool (SWAT) (Winchell and others, 2007). The primary objective is to construct and calibrate a water-quality model for the Cedar River basin, and develop methods within SWAT to estimate water-quality

at any point along any stream in the Cedar River Basin. The estimates of water-quality will then be compared to observation data collected. A measure of accuracy will be developed between the model and observed data sets.

Streamflow Estimation Models Recent years have seen the emergence of more sophisticated and accurate approaches to streamflow estimation through the use of statistical methods. These methods are relatively new and are in need of more research to validate their results. Three statistical based methods will be examined for this study. All three of these methods will make use of the existing streamgage network in Iowa and a 50-mile buffer in the surrounding states to compute daily flow at ungaged sites in ungaged watersheds. Current active gage stations will act as index gages to the ungaged locations. The State will be divided into regions of similar hydrologic characteristics to ensure that flow is not computed from areas that are not hydrologically related to the unknown site, similar to the technique for developing regions in Eash, 2001. To test the accuracy and compute an error for each of these methods, known gage locations will act as unknown sites and estimated hydrographs will be created. The estimated hydrographs will be compared with the observed hydrographs, and thus an estimate of error will be calculated for each method.

Water Quality Monitoring Data Collection Consistent, representative water-quality data from the major tributaries will allow the amount of nitrogen, phosphorus, and pesticides that are transported to the Missouri and Mississippi Rivers by ten major rivers draining Iowa to be quantified. A secondary purpose of the study is to collect data for sufficient amount of time to determine if land-use changes and agricultural practices are changing the water quality in major rivers in Iowa. Constituents to be analyzed include field parameters (temperature, conductance, dissolved oxygen, pH, discharge), major ions (alkalinity, silica, chloride, sulfate), nutrients, algal pigments (chlorophyll a, pheophyton a), pesticides, sediment (suspended sediment, turbidity), and bacteria (E. coli, total coliforms). Real-time water quality monitors will be installed and maintained at two streams. Real-time parameters include nitrate, temperature, conductance, and turbidity.

Surface-water Flow Network A network of real-time streamgages strategically located across the state is a critical component for many projects (flood prediction, water quality modeling, NPDES permitting). Data from these streamgages will be used to calibrate models and create statistical equations for computing streamflow at ungaged locations. Since these calculations will be based on the streamflow values, the data needs to be of the highest possible quality with minimal error. The methods used to measure and compute stage and discharge values will be quality assured using nationally accepted protocols that have been extensively researched (Rantz, 1982). Discharge measurements will be routinely performed at these sites during a variety of flow conditions to calibrate and verify stage-discharge relationships.

Ground-water Levels A ground-water climate response network has been established for nine climatological districts throughout Iowa to monitor ground-water response to climate changes. The hydrologic data will support PRMS and SWAT modeling by providing data on base flow, soil-zone reservoirs, subsurface recharge, and ground-water recharge, interflow or subsurface flow across the nine climatological districts. These nine wells will be equipped with telemetry that transmits a reading of water level to a data

relay office by satellite. The data will typically be updated every four hours for Web accessible viewing. These data constitute real-time hydrologic data and will be reviewed or edited for publication. Continual collection of data at these sites will serve as support to both the PRMS and SWAT modeling by creating a historic record to create initial modeling parameters.

Appendix B: IDNR and USGS Program Proposal for FFY2009

(October 2008 through September 2009**)**

Cooperative Program	**IDNR**	**USGS**	**Total**
Load Exports of Major Iowa Rivers	$37,675	$30,825	$68,500
PRMS Flood Model Comparison	$44,200	$36,180	$80,380
Water Quality Modeling (SPARROW)	$39,655	$32,445	$72,100
Surface-water Flow Est.	$20,515	$16,785	$37,300
Water Quality Monitoring Data Collection	$179,190	$146,610	$325,800
Stream Gaging Network	$203,533	$166,527	$370,060
Ground-water Levels	$22,462	$18,378	$40,840
Total	$547,230	$447,750	$994,980

Funding for this contract comes from monies appropriated for the State Water Plan and Water Quality Monitoring Program (Environment First Funding).

Mary Skopec, Geologist 4
Watershed Monitoring and Assessment Section, IGWS Bureau
Environmental Services Division

10/20/08